



SCOPE, PRICING, AND STATEMENT OF WORK

SOLICITATION NUMBER SGE500-17-R-0084

EMERGENCY REPAIR WORK FOR THE UTILITY CHILLERS, PUMPS,

CONTROLS AND DOMESTIC WATER SYSTEMS

FOR

THE U.S. EMBASSY IN TBILISI, GEORGIA

APRIL 26, 2017

Section B – Services and Costs

B.1 Supplies / Services

B.1.1 The Contractor shall provide personnel, supplies and equipment, as identified in this solicitation for mechanical repair services at Embassy Tbilisi as described in Section C. The request is for the emergency repair work of two rotary screw 407 C chillers, utility plant controls, one primary chilled water pump, one secondary chilled water pump, one heat water pump, and the domestic water systems (including the domestic water controls) in the central energy plant (CEP) as identified in “Section C - STATEMENT OF WORK”. A contract shall be awarded for work at a Firm Fixed Price plus Actual Reimbursable Expenses based on the requirements identified in “Section C - STATEMENT OF WORK”.

B.1.2 This contract includes the requirement for the contractor to purchase and ship tools, filters, gages, gaskets etc., new utility plant controls, new pumps, domestic water controls, and filters, gaskets, and driers for the four compressor change outs in the two rotary screw 407 C chillers. Specific items will be identified in “Section C - STATEMENT OF WORK”.

B.2 Schedule of Prices

B.2.1 The contractor shall complete all work, including providing all managerial, logistics, labor, tools, diagnostic equipment and services, as called for and defined in “Section C - STATEMENT OF WORK”. The price shall include all labor, tools, overhead (including insurance required by FAR 52.228-4, Workers' Compensation), and profit.

B.2.2 The Contractor shall provide repair services, logistics, balancing, labor and materials on **a firm fixed-price basis**. In establishing the fixed price for the effort under this contract, the hourly rates for the required services shall be in accordance with fixed **fully burdened** hourly labor rates. The fixed hourly rates shall include wages, overhead, G&A, profit and all employee fringe benefits, such as retirement, withholding for FICA and taxes, unemployment, workman's compensation and union dues (as applicable).

B.2.3 The Contractor shall furnish all equipment, supervision, logistics, administrative, labor, supplies, services necessary to comply with all U.S. OSHA standards, laws, and regulations as specified in the Contract Documents. All work shall be subject to the terms and conditions of this contract. The Contractor shall also furnish all equipment, tools, supervision, labor, supplies, services, and materials necessary to perform the work required for the emergency repair work of two rotary screw 407 C chillers, one primary chilled water pump, one secondary chilled water pump, one heat water pump, and the domestic water systems (including the domestic water controls) in the central energy plant (CEP) as identified in “Section C - STATEMENT OF WORK”.

B.2.4 The Contractor shall provide the repair services shown below for the contract:

CLIN	Description	Type of Services	No. of Service Visits	Unit Price / Service (\$)	Total price (\$)
1	Repair 2 Rotary 407 Chillers(Change out 4 chiller compressors, all contactors for every compressor)	Repair	1		
2	Replace 1 primary Chilled Water Pump and associated gages, and valves.	Repair	1		
3	Replace 1 Secondary Chilled Water Pump and VFD plus associated gages, and valves.	Repair	1		
4	Replace 1 Hot Water Pump and associated gages, and valves.	Repair	1		
5	Replace 2 Domestic Water Pump, controls and associated gages, and valves.	Repair	1		
6	Utility Plant Controls	Repair	1		
7	Travel & Hotel	Travel	1		
8	Replace 1 (B) Secondary Chiller Water Pump VFD	Repair	1		

B.2.5 Pricing Detail: The unit pricing provided for each CLIN shall be supported with cost details, as follows:

- (a) Labor hours
- (b) Labor category
- (c) Burdened labor rates (see B.2.6)
- (d) Estimated travel costs including airfare, hotel, per diem, and other allowed reimbursable expenses in CLIN 002 only. Do not include travel costs in other descriptions.

NOTE: CLIN 007 list Travel cost for this entire job.

B.2.6 Labor Rates: In addition to the Fixed Price contract items identified above, the cost proposal shall include a schedule of proposed fully burdened labor rates (as described in B.2.2) for the contract. These labor rates will be used, at the discretion of the Contracting Officer's Representative (COR), for potential pricing negotiations of related work that may be outside the scope of this contract effort but deemed advantageous to the Government in terms of expedient execution. Edit the table below, as necessary.

B.2.6 SCHEDULE

WJO 4/10/2017

POSITION (CLIN CLASS)	Base Salary	Fringes	Total
Project Manager			
Chief Estimator			
Mechanical Engineer			
Electrical Engineer			
Structural Engineer			
Senior Draftsperson			
Admin/Clerical			
Insulator			
Pipefitter/Steamfitter			
Plumber			
Sheetmetal Mechanic			
Warehouse Manager			
Laser Survey Technician			
Water Treatment Technician			

Test and Balance				
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B.3 Ordering Office

B.3.1 The contract work is located in Tbilisi Georgia at the following address:

American Embassy Tbilisi
Facility Management - Overseas Buildings Operations
11 George Balanchine St.
Tbilisi Georgia 0131

B.4 Travel

B.4.1 In determining the cost of travel, the terms and conditions of the Federal Travel Regulations (FTR) and Joint Travel Regulation (JTR) shall apply to all travel and travel-related matters authorized under this contract; travel and travel-related expenses shall not exceed the maximum allowable under the FTR and JTR. Travel, lodging and Per Diem rates shall be in accordance with Federal Travel Regulations / Joint Travel Regulation. The current rates are as follows for Tbilisi:

- Maximum Lodging Rate is \$236 USD per night.
- Meal and Incidental Expenses is \$105 USD per day.

B.4.2 Travel will be included as part of the contract line items identified in Section B.2.

B.4.3 In connection with authorized travel, the following items are to be on a fixed price basis which will require a receipt for reimbursement:

- (a) The cost of domestic and overseas economy-class (coach) airfare.
- (b) The cost of hotel or housing accommodations and other incidentals when travel is undertaken.
- (c) Miscellaneous expenses incurred in connection with the travel.

B.4.4 Miscellaneous travel items such as taxi fares and other ground transportation expenses incurred in connection with the travel, and airport taxes are also to be on a fixed price basis (receipts required).

B.5 Cost of Supplies

B.5.1 The cost of any supplies required in conjunction with the services rendered herein shall be included in the proposed firm fixed-price unless otherwise noted.

B.6 Government-Furnished Property

B.6.1 Government Furnished Equipment (GFE): The Government will provide the 4 York 407C DSX compressors, oil, and 1000 lbs of 407C refrigerant. Post has a welding machine, if needed.

B.7 Prices

B.7.1 The burdened hourly labor rates requested in Section B.2 will be established for this contract. These rates are the maximum rates allowable under the contract for United States based personnel performing services in the listed disciplines. These rates will be used for any professional services that are included in "Section C - STATEMENT OF WORK" and may apply to work outside the scope of this contract, except where local labor is acceptable and available at reduced rates. Rates for local labor shall be established in the cost proposal.

B.7.2 If any subcontractors are utilized, they shall provide the required disciplines necessary to properly execute the defined work in "Section C - STATEMENT OF WORK".

B.7.3 Subcontracted providers of services, if utilized, must be identified. If no Subcontract Provider is identified, the Contractor will provide these services with the in-house resources of the Contractor.

Section C – Statement of Work

C.1 General

C.1.1 In order for Embassy Tbilisi's operations to stay open this summer, emergency repair services for the chilled water plant is required. The Contractor shall be responsible for the change out of four chiller compressors (the new compressors shall be provide by the Embassy), utility plant controls, one primary chilled water pump, one secondary chilled water pump, one hot water pump, two domestic water pumps, and repair of the domestic water controls. The contractor will also be responsible for the replacement of all CEP automatic air vents, supply valve, discharge valve, pressure and temperature gages on every pump replacement as described in the Statement of Work.

C.1.2 Personnel. The Contractor shall be responsible for providing qualified technicians (with at least one of each trade at the journey-man level or equivalent) with relevant experience of more than 3 years to meet the minimum requirements established below to perform the emergency repair services in accordance with the Statement of Work. Helper positions do not need to meet this 3 year minimum requirement.

C.1.3 The objective of the emergency repair services is to ensure the chilled water plant can safely operate until system components and the chillers can be replaced in late fall of 2017. The following equipment shall be replaced by the Contractor:

1. Four compressors on two York rotary 407 chillers – Model # YCAS1215EB0YGA – capacity – 1168.7 kW - The compressors, refrigerant, and oil with are provided by the Government. The Contractor is responsible for the filters, gaskets etc. required to change the compressors out.

2. One primary Bell & Gossett chilled water pump – Model # 1510-5E (or equal), 380 Volts, 3 phase, 50 hertz, 15 hp. The Contractor shall install a new supply and discharge valve, pressure and temperature gages.
3. One secondary Bell & Gossett chilled water pump – Model # 1510-6G (or equal), 380 Volts, 3 phase, 50 hertz, 60 hp. The Contractor shall install a new supply and discharge valve, pressure and temperature gages.
4. One hot water Bell & Gossett pump – Model # 1510-2BC (or equal), 380 Volts, 3 phase, 50 hertz, 25 hp. The Contractor shall install a new supply and discharge valve, pressure and temperature gages.
5. Two domestic water pumps from the packaged Tri-Plex pumping package (or equal). 380 Volts, 3 phase, 50 hertz, 10 hp. The Contractor shall replace all associated controls and the panel.
6. Building Automation Plant Controls and integrate to the existing Johnson Controls N2 Metasys system.

NOTE: If the Contractor proposes alternate equipment; the Contractor must provide proof that the proposed equipment will be compatible with all other pieces of equipment in the system , and ensure safe operation of the system.

C.1.4 The Contractor shall also be reimbursed for costs for any materials/equipment ordered under the task order above and beyond items in Section B.2.4 if additional items are found during the emergency visit. No profit shall be added to this material/equipment. All costs of materials/equipment shall be itemized on the invoice, such as purchase price of material/equipment, cost of transportation and cost of handing.

C.1.5 The contractor will provide a minimum of 3 sources of equipment with cut sheets (Specification Sheet) to replace the existing equipment with like in kind. In addition, the replacement of the existing equipment will be required to be more energy efficient. The goal is to reduce the HVAC utility load by 25 percent if possible.

C.1.6 The work will be performed in and/or serving the Controlled Access Areas (CAA) – restricted spaces at Post. Additional security provisions are required to access and work these areas. The contractor does NOT need a security clearance. All work will be in the unclassified areas. The U.S. Government will provide security escorts if required and when necessary.

C.1.7 All work shall be accomplished in a manner which conforms to the intent of all applicable manufacture guidelines, OBO 2016 design standards, IBC, ASHRAE, NFPA/NEC, U.S. EPA, and DOS policy, procedures, and directives; causes no damage to buildings or property; endangers none of the building occupants or workers during these task; and leaves the areas safe for occupancy.

C.1.8 The Contractor shall carefully review and coordinate drawings and specifications, and other project documents before submittal. This includes identifying all interface points and controls between drawings and documents. The Contractor shall have a quality control program in effect, which will require his employees and consultants to thoroughly review and coordinate

all project data prior to submittals. The Contractor shall correct deficiencies, ambiguities, conflicts, and inconsistencies before submitting documents or they will be rejected by the Contracting Officer. The letter of transmittal shall certify that all documents have been reviewed and coordinated prior to submittal. The certification shall be signed by a principal of the Contractor's firm. The Contracting Officer's Representative (COR) will review and approve the Quality Assurance/Quality Control (QA/QC) program proposed by the Contractor. This program shall indicate the method of controlling the quality of all work produced by the Contractor and consultants. Refer to FAR Clause 52.236-23, "Responsibility of the Architect/Engineer Contractor".

C.1.9 Superintendence by Contractor: The entire operation of the contracted services shall be superintended by the Contractor's liaison, who shall maintain a close contact with the Contracting Officer and the COR in order to coordinate the performance of the contracted services with the needs of the Government. The liaison, (or his/her qualified assistant), shall be on duty throughout the normal operating hours of the Embassy. S/he shall also superintend the performance of the contracted services on Saturdays, Sundays, and holidays.

C.1.9.1 Quality Assurance: The Contractor shall institute an appropriate inspection system including checklists of duties to be carried out, ensuring these duties are carried out by the supervisory staff and senior employees, and carrying out during the emergency repair services to determine whether the various services are being performed according to the contract requirements. Any shortcomings and/or substandard conditions noted in such inspections shall be promptly corrected and improved; any conditions beyond the responsibility of the Contractor shall be brought to the attention of the Contracting Officer or COR, for disposition.

C.1.9.2 Inspection by Government: The services being performed hereunder and the supplies furnished therefor will be inspected from time to time by the COR, or his/her authorized representatives, to determine that all work is being performed in a satisfactory manner, and that all supplies are of acceptable quality and standards. The Contractor shall be responsible for any countermeasures or corrective action, within the scope of this contract, which may be required by the Contracting Officer as a result of such inspection.

C.2 Scope of Work

C.2.1 Emergency Repair Services for the two York rotary screw 407 C chillers.

C.2.2 General: The Contractor shall provide all necessary managerial, administrative and direct labor personnel as well as all transportation, tools, instrumentation, equipment and supplies required to do emergency repair work of two York rotary screw 407 C chillers. The Contractor shall provide the services of qualified, trained, manufacturer certified technicians to perform the required SOW.

C.2.2 The York rotary screw 407 C chillers shall be placed, if technical condition allows, in a safe, reliable operating condition until they can be replaced in late fall of 2017. If the chillers cannot be placed in a safe, reliable operating condition, the contractor shall provide the Government with an alternated plan to keep the Embassy compound operational until the equipment can be replaced.

C.2.2 Compressor change-out general emergency repair service requirements:

1. The Contractor shall replace 4 compressors on the two York rotary screw 407 C chillers.
2. System Cleanliness is one of the most important factors that affect system and compressor reliability. Evacuation and dehydration procedures from the manufacture shall be followed. The 4 compressor replacements shall be evacuated to 500 microns.
3. The torque for the solenoid valve shall not exceed 10 ft lbs for valve body and 3 ft lbs for the coil.
4. Compressor must not run backwards at any time. The contractor shall be responsible for replacement of the compressor at their cost if they install and run the compressors backwards. All DSX compressors run clockwise, facing the suction end.
5. A rotation test and report must be shown to the COR prior to running the compressors.
6. The compressors must not run with the discharge service valve partly open or closed. The contractor shall be responsible for replacement of the compressor at their cost if they install and run the compressors with discharge service valve partly open or closed.
7. The suction gases will be set to the manufactures superheat temperature guidelines for 407 C refrigerant.
8. The compressors shall not be left in operation if the loading and unloading cannot be achieved.

C.2.3 Scope of work for the 4 compressor change outs:

1. Read and follow enclosed papers from York Manufacture before proceeding. The documents are attached for the Contractors convenience. All York Manufacture guidelines must be followed.
2. Lock and tag out the chiller power and water in order render the unit safe to repair.
3. Close the compressor shutoff valves
4. Remove electrical cover access to compressor.
5. Label and number all compressor terminal leads along with internal safety circuit wiring. The contractor is verify the terminal leads are installed per the manufactures guidelines.
6. Remove wiring and tie off to a safe place
7. Remove motor terminal box and make safe
8. Disconnect oil sump heater
9. Remove bolts on the discharge and suction valves to the compressor.
10. Remove compressor hold down bolts.
11. Slide compressor to edge of machine and place cribbing under compressor.
12. Remove compressor with manual crane
13. Unbolt new compressor from crating and remove blank off plates covering suction and discharge.
14. Lift new compressor into place and support with cribbing.
15. Install blank off plates on the bad compressor and reassemble crating to be returned for core charge refund.
16. Slide new compressor into place and reassemble vibration pads and stay bolts.
17. Clean mating surfaces on the suction and discharge valves seating areas.
18. Install new gaskets and tighten bolts.
19. Ensure that the compressor is charged with oil. Oil will be provided by the Government.
20. Charge system with new oil through the sperator or oil lines only. Pull a vacuum

on all oil lines that feed the compressor to ensure all refrigerant is removed and prior to initial start up. The oil level in the separator should NEVER be higher than the top sight glass in the oil separator at initial compressor startup.

21. Reassemble the motor terminal box and internal safety wiring.
22. Ohm the compressor and record readings prior to connecting electrically.
23. Reinstall motor leads and place cover on terminal box.
24. Pressurize compressor with Nitrogen to achieve 300 psi.
25. Leak check compressor and valves.
26. Open compressor valves to system and bring system pressure up to 300 psi and leak check the entire system.
27. Once leak check has been approved, remove pressure from the system.
28. Place vacuum pump on the entire system and evacuate the system to a level below 500 microns. Leave vacuum on for eight (8) hours and check for regain.
29. Charge with entire new charge of liquid refrigerant. Refrigerant shall be provided by the Government.
30. Remove old pitted electrical starters total of three (3) per compressor.
31. Install new contactors for the compressor and torque to manufacturers specs.
32. Tighten all electrical connections.

C.2.4 Scope of work for startup of the 4 compressors:

1. The Contractor shall follow all York manufacture guidelines for startup.
2. The Contractor shall fill out the following for each compressor and provide the original copy to the Government. Please see the attachment for the Contractors's convenience:
 - a. York's Loading/Unloading Diagnostic Procedure Check List
 - b. Preliminary Checklist
 - c. York's Start-up Worksheet
 - d. Start-up Record list
3. Provide startup and record all appropriate measurements to ensure proper operation.
4. The contractor shall provide 2 hours of training for the Government.
5. Ensure that slide valve loads properly.
6. Provide written report.
7. Place machine back into automatic service.
8. Recheck machine 24 hours after startup to ensure the chiller is operating within design parameters.

C.2.5 Scope of work for the one hot water circulation pump, one primary chilled water pump, one secondary chilled water pump, two domestic water pumps, and the domestic water pump controls replacement:

1. The Contractor must get approval in writing from the Government for the pumps, controls, and gages prior to ordering the materials.
2. Read and follow manufacture installation procedures before proceeding. All manufacture's guidelines must be followed.
3. Lock and tag out the pump to be worked on.
4. Unbolt pump from piping system.

5. Remove old pump
6. Provide and install new pump, gaskets, pressure and temperature gages, supply and discharge valve.
7. Bolt new pumps down to existing framing.
8. Provide and install new gaskets, valves, and gages then connect to piping.
9. Grout pump bases
10. Check alignment of new pump.
11. Rewire new pump using the existing whip if possible. If not, run new seal tight and wire
12. Fill pump and associated piping up to new shutoff valves.
13. Open system valves and start pump.
14. Record vibration reports for the new install.
15. Ensure the strainer is clear and correct mesh is installed.
16. Start new pump and check operations.
17. The contractor shall provide 2 hours of training for the Government on how to properly maintain the new pumps including how to align and grease the bearings.

C.2.6 Scope of work for the building automation control replacement. The new BAS system shall be the Honeywell Niagara Framework based building management solution or approved equal. The controls CANNOT utilize any wireless applications for the installation and operations. This request includes the requirement for the Contractor to purchase materials and equipment for the BAS including, but not limited to, such items as control components, equipment replacements, cabling, software and computers or related elements for the building automation controls located in the utility plant and integration into the existing system. All parts, controllers, sensor, etc. shall be the New Honeywell Niagara framework-based building management solution or approved equal.

Furnish all labor, materials and equipment necessary for a complete and operating Building Management System (BMS), utilizing Direct Digital Controls for the utility plant located in Tbilisi Georgia. All controllers furnished in this section shall communicate on a peer-to-peer bus over an open protocol bus BACnet and integrate to the existing Johnson Controls N2 system.

System architecture shall fully support a multi-vendor environment and be able to integrate third party systems via existing vendor protocols including, as a minimum, LonTalk, BACnet and Modbus.

All control devices furnished with this Section shall be programmable directly from the NiagaraAX Workbench upon completion of this project. The use of configurable or programmable controllers that require additional software tools for post-installation maintenance shall not be acceptable.

Any control vendor that shall provide additional BMS server software shall be unacceptable. Only systems that utilize the NiagaraAX Framework (or approved equal) shall satisfy the requirements of this section.

The BMS server shall host all graphic files for the control system. All graphics and navigation schemes for this project shall match those that are on the existing campus NiagaraAX Framework server.

At minimum, laptop computer including engineering/programming software to modify Operating System Server BMS programs and graphics shall be included. Owner shall receive all Administrator level login and passwords for engineering toolset at first training session. The Owner shall have full licensing and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the BMS.

OPEN NIC STATEMENTS - All NiagaraAX software licenses shall have the following NiCS: "accept.station.in=*"; "accept.station.out=*" and "accept.wb.in=*" and "accept.wb.out=*". All open NIC statements shall follow Niagara Open NIC specifications.

All JACE hardware products used on this project shall be made in the USA or come through the Tridium Richmond, VA shipping facility. JACE hardware products not meeting these requirements will not be allowed.

The objective of replacement is to eliminate current system malfunctions, breakdown and deterioration and integrate the new controls into the existing system. The new Building Automation System shall be placed in a safe, reliable, efficient operating condition, and integrate into the existing Johnson Controls BAS system and workstation. The following information provides a summary of each BAS that is to be replaced:

1. Johnson Controls: 1. Network Automation Engine Controller. See picture below.



2. Johnson Controls: 2 DX 9100 Controllers
3. All control including but not limited to: sensors, operator and end device point-to-points (both analog and digital)

Building Controller:

- Building Controller (BC-1) to connect to new Honeywell Niagara Framework based building management solution or approved equal.
- Building Controller will provide embedded web server for site connectivity, data logging, alarming, and scheduling & network management functions.
- Incorporate new BACnet controllers serving Chilled Water System & Hot Water System and create new visualizations.

Honeywell Niagara Framework based building management solution controller(s) and programming of control sequences shall include at the minimum for the chilled water system:

- Chiller U-ACC-01 & U-ACC-02 open protocol integration. Integration will provide entering & leaving chilled water temperatures, compressor(s) status, and fan status(s) (Existing).
- Chiller U-ACC-01 & U-ACC-02 Enable/Disable control (Existing).
- Chiller U-ACC-01 & U-ACC-02 Chilled Water Temperature Reset (Existing).
- Chiller U-ACC-01 & U-ACC-02 Chilled Fault (Existing).
- Chiller U-ACC-01 & U-ACC-02 Chilled Water Pump Command (Existing).
- Chiller U-ACC-01 & U-ACC-02 Evaporator Isolation Valve 2-position control. (Existing).
- Chiller U-ACC-01 & U-ACC-02 Chilled Water Flow via Venturi Station VS-1 & VS-2 (Existing).
- Primary Chilled Water Pumps U-PCHP-01 & U-PCHP-02 Start/Stop control.
- Primary Chilled Water Pumps U-PCHP-01 & U-PCHP-02 Status Switches.
- Secondary Chilled Water Pump U-SCHP-03 & U-SCHP-04 VFD Start/Stop control.
- Secondary Chilled Water Pump U-SCHP-03 & U-SCHP-04 VFD Speed modulating control.
- Secondary Chilled Water Pump U-SCHP-03 & U-SCHP-04 VFD Fault for monitoring.
- Secondary Chilled Water Pump U-SCHP-03 & U-SCHP-04 VFD Current for monitoring.
- Secondary Loop Differential Pressure Sensor for control and monitoring.
- Secondary Loop Chilled Water Flow Meter FM-02 for control and monitoring.
- Secondary Loop Chilled Water Supply Temperature sensor for monitoring.
- Secondary Loop Chilled Water Return Temperature sensor for monitoring.
- Bypass Mix Water Temperature sensor for monitoring.

Honeywell Niagara Framework based building management solution controller(s) and programming of control sequences shall include at the minimum for the hot water system:

- Boiler U-B-01 & U-B-02 Enable/Disable control (Existing).
- Boiler U-B-01 & U-B-02 Boiler Fault (Existing).
- Boiler U-B-01 & U-B-02 Isolation Valve 2-position control. (Existing).
- Primary Hot Water Pumps U-HWP-01 & U-HWP-02 Start/Stop control.
- Primary Hot Water Pumps U-HWP-01 & U-HWP-02 Status Switches.
- Primary Loop Hot Water Flow Meter FM-02 for control and monitoring.

- Primary Loop Hot Water Supply Temperature sensor for monitoring.
- Primary Loop Hot Water Return Temperature sensor for monitoring.
- Primary Loop Hot Water Return Temperature sensor for monitoring.

Control Submittals:

Product Data: Manufacturer's data sheets on each product to be used, including:

- Preparation instructions and recommendations.
- Storage and handling requirements and recommendations.
- Installation methods.

One digital and one hard copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers' catalog data sheets and installation instructions. Submit in printed electronic format. Samples of written Controller Checkout Sheets and Performance Verification Procedures for applications similar in scope shall be included for approval.

Shop drawings shall also contain complete wiring and schematic diagrams, sequences of operation, control system bus layout and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings.

Upon completion of the work, provide x complete sets of 'as-built' drawings and other project-specific documentation in 3-ring hard-backed binders and on Flash media. Any deviations from these specifications or the work indicated on the drawings shall be clearly identified in the Submittals.

Acceptance Testing:

- Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- The Control System Contractor shall perform tests to verify proper performance of components, routines and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies

Operator Training:

- During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the Control System Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- The Control System Contractor shall provide 16 total hours of comprehensive training in multiple sessions (16 hours total) for system orientation, product maintenance and troubleshooting, programming and engineering, if not provided under a previous contract at the site using the same brand and type of controllers within the previous 3 years. These classes are to be spread out during the 1st year warranty period. The first class starting after final commissioning and the last class is to be in the last month of 1-year warranty period.
- The Control System Contractor shall provide 16 hours (total) of instruction to the owner's designated personnel on the operation of the BMS and describe its intended use with respect to the programmed functions specified. Operator orientation of the BMS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories and appropriate operator intervention required in responding to the System's operation.

Commissioning of Controls:

After complete installation the Contractor shall create site specific Checklists for the controllers and the equipment controlled and/or monitored by the new BAS system. These Checklists shall be developed from the new and existing As-Built Data; Operation & Maintenance Data; Set Point Data; Time Schedule Data; and any other data relevant to the PM effort found at Post. This data shall be reviewed by the Contractor to determine the operational baseline requirements that will be used in the Checklists.

Validate the network connectivity of all new and existing BAS controllers, Operator Work Stations (desktop and laptop computers), Servers, and Network components (repeaters, switches, hubs, etc...). Investigate and remediate any issues found.

Time Schedules: Provide new time schedules and validate correct operation based on actual time of day and facility occupancy. Schedules shall reflect the actual occupancy patterns of the buildings at Post.

BAS Trend and Alarm Configuration: The Contractor shall setup BAS Alarm History and Trend log files for the new BAS system.

Sensor, Operator and End Device Point-to-Point Checkout: This checkout shall verify that each point indicated in the new and existing BAS system for the utility plant is the actual physical point connected to the controller and the point is functioning properly. Any discrepancies shall be investigated and adjustments made as necessary so that all sensors monitored and devices controlled by the BAS match the associated points indicated in the BAS and provide the desired functionality.

Sensor / End Device Calibration Verification: The calibration of hardware points in the new and existing BAS system for the utility plant shall be verified against actual field conditions. Sensors shall be calibrated to within the accuracy range stated in the associated manufacturer's literature. Operators and other end devices shall be adjusted so that the BAS output signal corresponds to operator's or end device's full control range. Where sensors, operators and other end devices are not capable of being adjusted, the Contractor shall note the deviation between actual and measured value for sensors and between actual output function and commanded signal.

- (1) The Contractor shall use calibrated instrumentation with a higher accuracy than the sensor, end device or operator being calibrated.
- (2) Calibrated instrumentation used shall have been certified by an independent calibration agency within one (1) year of the dates used.

BAS Operator Work Station: The Contractor shall review the condition of the existing BAS Operator Work Stations determine if the hardware is in need of being upgraded and integrate to the new controls.

Warranty Period:

- Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- Within this period, upon notice by the Owner, any defects in the BMS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.
- Maintenance of Computer Software Programs: The Control System Contractor shall maintain all software during the warranty period. In addition, all factory or sub-vendor upgrades to software shall be added to the systems, when they become available, at no additional cost. New products are not considered upgrades in this context.
- Maintenance of Control Hardware: The Control System Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the controllers, control devices and associated peripheral units during the warranty period. The Control System Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all software is functioning correctly.
- Service Period: Calls for service by the Owner shall be honored within 40 hours and are not to be considered as part of routine maintenance.
- Service Documentation: A copy of the service report associated with each owner-initiated service call shall be provided to the owner.